

Appl. No. 10/640,340
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Reply to Office Action of December 16, 2005

REMARKS

By the above amendments, Applicant has cancelled claims 8-18; and has amended claims 1, 4-7 and 19-20; and has amended the specification and the abstract. The use of the terminology "growth-affective" is supported, e.g., in Paragraph [0022]. No new matter has been entered via any of the above amendments.

Election/Restrictions

Restriction is required under 35 U.S.C. 121.

In response to the restriction requirement, Applicant affirms the election without traverse to prosecute the invention of Group I, being claims 1-7 and 19-20; the election having been made by Wei Te Chung by telephone on November 30, 2005. Applicant has cancelled the non-elected claims 8-18, retaining the right to file a divisional application with respect thereto.

Claim Rejections Under 35 U.S.C. 112

Claims 1-7 and 19-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. Specifically, the phrase "catalyst-doped material" is not enabled in the specification because there is no mention of a catalyst being doped or a catalyst doping another material.

In response to this rejection, Applicant has amended claims 1, 4-7, and 19-20. The phrase "catalyst-doped material" has been replaced by

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“growth-affective material” where necessary throughout the specification, including the claims. Such material can be selected from group consisting of copper, cobalt, nickel, molybdenum, ruthenium, manganese or a combination thereof, and is “capable of varying a reaction rate of synthesis of carbon nanotubes.” (See, e.g., Paragraphs [0022] and [0023].) Applicant submits that the amended claims 1-7 and 19-20 now comply with the enablement requirement and are thus in allowable form.

Claims 1-7 and 19-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(a.) The phrase “catalyst-doped material” is unclear.

(b.) In claims 6 and 19, the phrase “catalyst-doped material gradually increases or decrease” is unclear because it cannot be ascertained what increases.

In response to the rejections, Applicant has amended claims 1, 4-7 and 19-20. (a.) The phrase “catalyst-doped material” has been replaced with “growth-affective material.” Similarly relying on the above discussion, Applicant submits that claims 1-7 and 19-20, as amended, are now clear. (b.) Regarding claims 6 and 20 (the claims in which the subject matter in question appears), Applicant has amended such claims to specify that “a content of said growth-affective material gradually...”. Applicant submits that claims 6 and 20, as amended, are now clear.

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Claim Rejections Under 35 U.S.C. 103

Claims 1-5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dai et al. (US 6,232,706) in view of Rodriguez et al. (US 5,653,951) and in view of the Yao et al. reference.

Responsive to these rejections, Applicant has amended claims 1, 4-5 and 19. Applicant submits that claims 1-5 and 19, as amended, are novel and unobvious over the cited references.

Claim 1, as amended, recites in part:

...a plurality of alloy catalytic nano-sized particles formed on the substrate; and an aligned carbon nanotube array extending from the alloy catalytic nano-sized particles and progressively bending in a predetermined direction...
(Emphasis added.)

First of all, none of the cited references provides such a suggestion or motivation sufficiently for one skill in the art to combine or modify the references. Dai et al. discloses "a field emission device comprising a substrate; a catalyst material deposited on a porous surface of the substrate; a bundle of parallel carbon nanotubes extending from the catalyst material in a direction substantially perpendicular to the substrate." (See claim 1 of Dai et al.) In particular, Dai et al. points out that a shortage of a conventional method is that the resulted carbon nanotubes are not aligned perpendicular to the substrate. (See Column 1, lines 57-59.) Accordingly, an intended purpose of the Dai et al. reference is to provide a field emission

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device with carbon nanotubes substantially aligned perpendicular to the substrate. However, Examiner contends that the Yao et al. reference teaches that nanotubes bundles produced by CVD often bend (Applicant disagrees with this assertion, see discussion below) and suggests the modification of Dai et al. to provide for bent nanotubes instead. Thus, the proposed combination of the Dai et al. reference with the Yao et al. reference, in particular, would result a device unsatisfactory for the intended purpose of Dai et al. (MPEP §2143.01 and the related case law cited thereat). Therefore, there is no suggestion or motivation to make the proposed modification under 35 U.S.C. §103(a).

Second, Applicant asserts that the proposed combination does not teach or suggest all the claim limitations. Examiner asserts that the Yao et al. reference teaches the carbon nanotube produced by CVD often bend, particularly in Figure 2b. Applicant disagrees with that assertion because that the Yao et al. reference does not provide any statement or indication supporting such conclusion. In fact, the picture of Figure 2b shows only "some branching tubes" which was actually "the replica of the branching AAO nanochannels." (see page 11396) Yao et al. does not teach or suggest "aligned carbon nanotube array extending ...and progressively bending in a predetermined direction." The other cited references are also silent on this limitation. Therefore, the proposed combination, even if it could be made, does not disclose or suggest all the limitations required in claim 1, as amended.

Therefore, Applicant submits that the claim 1, as amended, is both novel and unobvious over the cited references, taken alone or in combination. Accordingly, reconsideration and withdrawal of the rejection are respectfully

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requested.

Claim 19, as amended, recites in part:

“...an aligned carbon nanotube array respectively extending from the alloy catalytic nano-sized particles with gradually respective one of increasing lengths and decreasing lengths of said carbon nanotubes of the carbon nanotube array arranged along a direction on said substrate...”
(Emphasis added.)

For similar reasons discussed above, Applicant asserts that: (1.) the proposed combination of the Dai et al. reference with the Rodriguez et al. and the Yao et al. references would result a device unsatisfactory for the intended purpose. Therefore, there is no suggestion or motivation to make the proposed modification. (2.) The Yao et al. reference does not disclose at least the limitation of “an aligned carbon nanotube array respectively extending from the alloy catalytic nano-sized particles with gradually respective one of increasing lengths and decreasing lengths of said carbon nanotubes of the carbon nanotube array arranged along a direction on said substrate”, as required in claim 19, as amended. In accordance with the Yao et al. reference, specifically in Figure 2(b), the picture merely shows some branching tubes coexisting with other nanotubes. The Yao et al. reference keeps silent on the lengths of the nanotubes. The other cited references also do not disclose or suggest that length limitation as required in claim 19, as amended. Specifically, Dai et al. discloses the nanotubes to be of the same length (Fig. 1) or to decrease in length and then increase, along a given direction (Fig. 1, also). Therefore, the proposed combination, even if it could be made, does not disclose or suggest all the limitations required in

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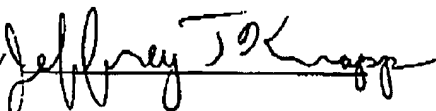
claim 19, as amended.

In summary, Applicant submits that claims 1 and 19, as amended, are novel and unobvious over the cited references, taken alone or in combination.

Claims 2-5 and 20 depend directly from claims 1 and 19, respectively. Since claims 1 and 19 are now in condition for allowance for the reasons set forth above, Applicant submits that claims 2-5 and 20 are also unobvious and patentable over the cited references, taken alone or in combination. As such, reconsideration and withdrawal of the rejection of claims 2-5 and 20 are respectfully requested.

In view of the foregoing, the present application as claimed in the pending claims is considered to be in a condition for allowance, and an action to such effect is earnestly solicited.

Respectfully submitted,
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